

CHAETOGNATHA

BY

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WITH SIX TEXT-FIGURES

THE material examined consisted of samples of the Chaetognatha taken during the Great Barrier Reef Expedition from nearly 70 stations. The majority of the samples were from townettings taken weekly at a fixed position inside the reef. This position is referred to as 3 mi. E., being 3 miles east of the Laboratory on Low Island. The townettings were taken through a complete year from July, 1928, to July, 1929. The types of net used were one-metre stramin having 16 strands to the inch, coarse silk with 58 strands to the inch, and fine silk with 200 strands to the inch. The hauls were principally oblique, and details of the method used together with further information as to the conditions under which each haul was made are given in Vol. II, No. 2 of this series of reports. The depth at the station 3 mi. E. was about 32 metres, and the maximum depth fished at this station varied from about 19 to 26 metres, the average being about 22 metres. Each haul was of 30 minutes' duration.

The total number of Chaetognatha captured at this station was considerable. The number examined in the samples was over 6000. The station numbers for catches of Chaetognatha made at the 3 mi. E. position were as follows: 2, 3, 5, 6, 7, 9, 10, 12-15, 17, 18, 22-25, 27, 30, 30*a*, 31-42, 47, 48, 51-61, 63, 66, 67.

Some hauls were also made at stations in channels running through the reef, and a few just beyond the edge of the reef and in deeper water outside the reef.

Particulars of these stations at which Chaetognatha were captured are given on next page.

Chaetognatha were also captured at two additional stations: Station 1, 2 mi. N.E. on 27th July, 1928, where oblique hauls were made and the depth was 31 m., the net touching the bottom; Station 4 on 7th Aug., 1928, 1 mi. N., depth 15 m., horizontal hauls being made at the surface (3.5 m. average depth of hauls).

Finally, one haul from which a sample of Chaetognatha was received was made at the Anchorage, Low Is., on 19th Sept., 1928, and two night hauls, one at the foregoing station on 1st Oct., 1928, and one at Station 21, 3 mi. E. on 22nd Oct., 1928. Chaetognatha were also received from one station (16, 3 mi. E.) at which horizontal hauls were made with a closing net at the surface and at five different depths as a test of depth distribution. In all just over 9200 specimens were examined in the present collection.

The species present were the following:

<i>Sagitta bedoti</i> Béraneck.	<i>Sagitta pulchra</i> Donc.	<i>Krohnitta subtilis</i> Grassi.
„ <i>bipunctata</i> Q. and G.	„ <i>regularis</i> Aida.	<i>Pterosagitta draco</i> Krohn.
„ <i>enflata</i> Grassi.	„ <i>robusta</i> Donc.	
„ <i>hexaptera</i> Orb.	„ <i>serratodentata</i> Krohn.	
„ <i>lyra</i> Krohn.		
„ <i>neglecta</i> Aida.		

Station number.	Date.	Position.	Depth in metres.	Max. depth* fished by net in metres.
8	24th Aug., 1928	16° 30' S. 145° 52' E. (In Trinity Opening)	45	28·5
11	6th Sept., 1928	16° 24' S. 145° 52' E. (In Trinity Opening)	61	34·5
19	20th Oct., 1928	16° 20' S. 146° 3' E. (Outside Trinity Opening)	225	Approx. 180
20	„ „	16° 19' S. 146° 7' E. (Outside Trinity Opening)	>600	Approx. 250
26	19th Nov., 1928	16° 24' S. 145° 53½' E. (In Trinity Opening)	57	34
28	23rd Nov., 1928	16° 19' S. 146° 5' E. (Outside Trinity Opening)	>600	Approx. 580
29	24th Nov., 1928	16° 17' S. 146° 2' E. (Outside Trinity Opening)	ca. 200	bottom
43	26th Feb., 1929	15° 16' S. 144° 26½' E. (Off Cape Bedford)	30	24
44	27th Feb., 1929	14° 44' S. 145° 27½' E. (Off Lizard Island)	31	23·5
45	28th Feb., 1929	14° 31' S. 145° 35' E. (Outside Cook's Passage)	>600	Approx. 500
46	„ „	14° 32' S. 145° 32' E. (Inside Cook's Passage)	33	23
49	17th Mar., 1929	15° 47' S. 145° 47' E. (Inside Papuan Pass)	46	31
50	18th Mar., 1929	Outside Papuan Pass	>400	Approx. 400

There have been reports on three principal collections of Chaetognatha from coastal waters of eastern Australia, viz. Ritter-Záhony (1909) from the Gazelle Expedition, Johnston and Taylor (1919) and Tokioka (1940). The species recorded in these reports are *Sagitta ai*, *S. australis*, *S. bipunctata*, *S. enflata*, *S. hexaptera*, *S. lyra*, *S. minima*, *S. neglecta*, *S. planctonis*, *S. pulchra*, *S. regularis*, *S. robusta*, *S. serratodentata*, *S. tenuis*, *Krohnitta subtilis*, *Pterosagitta draco* and *Spadella moretonensis*. Of these *S. australis* is a synonym for *S. enflata*, which leaves 16 species as having been recorded. It will be seen from the previous list that 11 of these are represented in the present collection, though some were present only in small numbers. *S. bedoti* appears to be new to the eastern Australian water, though Tokioka (1940) has reported that it is a common species in the north Pacific and it has been reported from Sharks Bay by Ritter-Záhony (1910), on the west coast of Australia.

The various species differed very much in the frequency with which they occurred and in the number captured. The commonest forms were *S. enflata*, *S. neglecta* and *S. robusta*, and of these *S. enflata* was found in every haul taken by the expedition from which

* Where the maximum depth fished at a station is given as approximate the haul was vertical, and the figure given is that of the maximum length of wire out. The actual maximum depth fished will therefore be somewhat less than these figures.

Chaetognatha were received. *S. neglecta* and *S. robusta* were taken very frequently, but the numbers were much smaller than those of *S. enflata*. Of the remaining species, *S. bedoti*, *S. pulchra* and *S. serratodentata* come next in abundance, and the remainder were captured only in very small numbers. The actual numbers of individuals of the various species received are given in the systematic part of this report and the distribution is dealt with in a separate section.

SECTION I. SYSTEMATIC.

Sagitta bedoti Béraneck.

Béraneck, 1895-96; Ritter-Záhony, 1911; Burfield and Harvey, 1926; Burfield, 1930; Tokioka, 1939.

458 individuals.*

This species is especially difficult to identify when immature, and can easily be mistaken for several others, *e. g.*, *neglecta*. The shorter overall length of the latter species when mature is helpful, but the nature of the seminal vesicle (Tokioka, 1939) is very similar in both species, and the rayless region of the lateral fins in *bedoti* can only be seen in well-preserved and uncrushed specimens. The positive character of the large number of posterior teeth in *bedoti* is useful when they can be clearly counted, but even here there is an overlap between the range of number in *bedoti* and in *neglecta*.

The occurrence of this species in the present collection is notable and is dealt with in the second section of this report.

Formulae. :†

14 — 12	28 — 23	6 (7)	7 — 11	16 — 31
11 — 8	29 — 25	6 (7)	7 — 12	15 — 30

Sagitta bipunctata Q. and G.

Quoy and Gaimard, 1827; Burfield and Harvey, 1926; Burfield, 1930; Johnston and Taylor, 1919; Tokioka, 1939 and 1940.

91 individuals.

None of these was fully mature and identification was difficult in consequence. So far as could be judged they conformed to the usual description of the species.

Formulae. :

10 — 9	28 — 27	9	6 — 7	12 — 14
9 — 6	27 — 23	8 (9)	5 (6)	10 — 13
6 — 4	27 — 25	8	4 (5)	10 (11)

* The numbers of individuals given in the Systematic section of this report refer to the numbers of specimens in the samples received for examination.

† The tables of formulae given for each species follow the usual arrangement. The first column gives the length of the specimens in millimetres (without tail fin); the second the proportional length of the tail expressed as a percentage of the total length; the remaining three columns give the number of jaws, the number of anterior teeth, and the number of posterior teeth respectively.

Sagitta enflata Grassi.

Grassi, 1883 ; Burfield and Harvey, 1926 ; Burfield, 1930 ; Tokioka, 1939 and 1940.

6203 individuals.

The most abundant of all the species captured. A number of mature individuals, though none reached the maximum size described for this species. This is one of the most characteristic of the warm water species, and there is no doubt as to its identity. The short ovaries and concentrated testes seen through the transparent body are notable features. In some specimens the testes appeared to be mature with fully developed seminal vesicles, but the ovaries were not fully developed. This may indicate the possibility of the species being protandrous.

Formulae. :

20·5 — 17	18 — 16	8 (9)	8 — 10	13 — 15
17 — 13	20 — 18	9	7 — 10	10 — 16
12 — 10·5	21 — 17	8 (9)	6 — 9	9 — 14

Sagitta hexaptera Orb.

D'Orbigny, 1836 ; Johnston and Taylor, 1921 ; Burfield and Harvey, 1926 ; Burfield, 1930 ; Bollman, 1934 ; Fraser, 1937 ; Tokioka, 1939 and 1940.

13 individuals.

The few captured of this species were nearly all obtained further out than at the principal station inside the reef. They were all immature except one of 26·5 mm. length which was apparently approaching maturity.

Formulae.

26·5 — 10	25 — 23	7 — 10	1 — 3	2 — 4
10 — 7	24 — 22	6 — 9	1 — 3	2 (3)

Sagitta lyra Krohn.

Krohn, 1853 ; Johnston and Taylor, 1921 ; Burfield and Harvey, 1926 ; Burfield, 1930 ; Tokioka, 1939 and 1940.

31 individuals.

The majority of these were captured at stations inside the reef. None of the specimens was mature and the longest measured 18·0 mm. This species has been recorded up to 38 mm.

Formulae. :

18 — 11	18 — 14	8 (9)	4 — 6	7 — 9
11 — 8	17 — 15	8	4 (5)	7 — 9

Sagitta neglecta Aida.

Aida, 1897; Johnston and Taylor, 1919, 1921; Burfield and Harvey, 1926; John, 1933; Tokioka, 1939.

644 individuals.

This species was second in abundance in this collection. The difficulties of identification are mentioned above under *S. bedoti*. A few individuals were mature.

Formulae. :

10 — 8	29 — 28	6 (7)	5 — 7	11 — 17
8 — 5	30 — 28	6 (7)	5 — 7	10 — 16

Sagitta pulchra Doncaster.

Doncaster, 1903; Johnston and Taylor, 1919; Burfield and Harvey, 1926; Tokioka, 1939.

241 individuals.

The largest specimens of this species were mature and well preserved. Although semi-transparent it retains its shape very well. The rayless regions of the lateral fins are well seen, and the anterior and posterior lateral fins almost touch one another. The seminal vesicle conformed to the *robusta* type as described by Tokioka (1939).

Formulae.

22 — 20	24 — 19	5 — 7	6 — 9	10 — 14
19 — 14	23 — 18	5 (6)	6 — 8	10 — 13
13 — 7.5	25 — 18	5 — 7	5 — 9	9 — 13

Sagitta regularis Aida.

Aida, 1897; Ritter-Záhony, 1911; Johnston and Taylor, 1919; Burfield and Harvey, 1926; Tokioka, 1939.

32 individuals.

This is a small form having a maximum length of 7 mm. though it appears to be mature at about 5 mm. It is a species which is fairly easy to recognize. Its opaque stiff body, complete set of fin rays, and rather cocoon-shaped seminal vesicle touching the posterior fin, make it rather like *S. neglecta*, but it differs from the latter species, especially in its smaller number of teeth, and in the voluminous collarette, which typically extends forward over the whole head from the front end of the anterior fin.

Formulae. ;

7 — 5	33 — 28	7 — 9	2 — 4	4 — 5
5 — 4	36 — 33	7 — 10	2 — 4	3 — 5

Sagitta robusta Doncaster.

Doncaster, 1903 ; Ritter-Záhony, 1911 ; Johnston and Taylor, 1921 ; Burfield and Harvey, 1926 ; Burfield, 1930 ; Tokioka, 1939 and 1940.

1298 individuals.

This was one of the commonest species in this collection. Tokioka (1939) has described a new species, *S. ai*, which is very closely related to *S. robusta*. The principal points of difference are stated to be in the length of mature individuals, the size of the head, the length of the collarette, the form of the corona and of the seminal vesicle. On examination of the best preserved specimens in the present collection, it was found to be impossible to separate them into the two species, although some of the features described for *S. ai* were seen in some individuals. Individuals range from 14.5 mm. to 6.5 mm. in length. The majority showed the features ascribed to *robusta*. Of the remainder there were a number which appeared to be quite mature, with seminal vesicles as described for *S. ai*, but they were only 10–12 mm. in length and the head was not comparatively larger than that of *robusta*. *S. ai* is said to be immature until it is more than 13.5 mm. long. On the other hand there were some specimens with several of the features given for *ai*, but with a very massive and extensive collarette characteristic of *robusta*. The measurements and numbers given in the formulae for the two species are also found to overlap almost completely.

The general formulae given for the two species are :

<i>S. robusta</i>	20	30 — 25	5 — 8	5 — 10	9 — 16
<i>S. ai</i>	19.5	30.4 — 26	6	7 — 10	11 — 15

This may therefore be an example of a variable species, and in this report all the specimens are considered as belonging to *S. robusta*.

Formulae. :

14.5 — 10	30 — 26	6 — 8	6 — 10	13 — 14
9 — 6.5	29 — 25	6 (7)	6 — 9	11 — 13

Sagitta serratodentata Krohn.

Krohn, 1853 ; Ritter-Záhony, 1911 ; Johnston and Taylor, 1919, 1921 ; Burfield and Harvey, 1926 ; Burfield, 1930 ; Bollman, 1934 ; Fraser, 1937 ; Tokioka, 1939, 1940.

180 individuals.

Tokioka (1939) describes a new species, *S. pseudoserratodentata*, which is very similar to the present species, and mentions that Aida noted that there was a large and a small form among the specimens of *S. serratodentata* collected from Japanese waters. In the present collection only one species can be identified with certainty. Tokioka states that *pseudoserratodentata* (1) is smaller when mature, (2) has fewer anterior and posterior teeth, (3) has a corona with the anterior end beginning at a slightly different position, (4) has a seminal vesicle of a somewhat different shape.

These characters were found represented to some extent individually in various specimens, but none were found with all the characters. In this connection it is noteworthy that Tokioka (1940) did not find any *pseudoserratodentata* in the eastern Australian collection examined by him. Moreover, in describing *serratodentata* in that collection from eight individuals, he notes that two show a variation in the seminal vesicle and that the number of posterior teeth in these two was less than in "the common Pacific individuals." Tokioka (1919) also describes for Japanese *serratodentata* a differing form of seminal vesicle. He therefore differentiates between a Pacific and an Atlantic or Mediterranean form, but with the exception of body length, the representative formulae which he gives for the latter form fall within the limits of the figures which he gives for *pseudoserratodentata*. It would seem clear that this species is definitely variable.* The reaching of maturity at a shorter body length may be connected with conditions, or may itself indicate a variable character. The longest individuals in the present collection were only 11.0 mm., but these and some shorter specimens appeared to be quite mature.

Formulae.

11.0 — 10	27 — 29	6 (7)	7 — 11	13 — 15
9 — 7	26 — 28	6	6 — 9	14 — 16
7 — 4	26 — 29	5 — 7	6 — 9	14 — 17

Krohnitta subtilis (Grassi).

Grassi, 1883, *Spadella* (part); Ritter-Záhony, 1911; Johnston and Taylor, 1919; Burfield and Harvey, 1926; Burfield, 1934; Tokioka, 1939 and 1940.

9 individuals.

These conform to previous descriptions. None appeared to be mature.

Formulae.:

10 — 6.5	32 — 36	7 (8)	11 — 14
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Pterosagitta draco (Krohn).

Aida, 1897 (*Spadella draco*); Krohn, 1853; Ritter-Záhony, 1911; Johnston and Taylor, 1919; Burfield and Harvey, 1926; Burfield, 1930; Bollmann, 1934; Tokioka, 1939 and 1940.

22 individuals.

None of these were mature.

Formulae.:

7 — 4	45 — 40	8 — 9	7 — 10	10 — 17
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* *Vide* also Burfield and Harvey, 1926.

SECTION II. DISTRIBUTION.*

A. HORIZONTAL DISTRIBUTION.

The total number of individuals of the various species which were caught at the different stations by day are given in the following table.

TABLE I.—*Total Numbers of Different Species of Chaetognatha Captured and the Stations at which they were Taken.*

Species.	Stations (3 mi. E.).	Total number.	Other stations.	Total number.
<i>S. bedoti</i> . . .	2, 3, 5, 6, 9, 10, 14, 15, . 61, 63, 66, 67	5848	1, 4, 8 .	59
<i>S. bipunctata</i> . . .	14, 15, 18, 22, 27, 40, . 52	299	11, 19, 28, 29, 45, 50 .	279
<i>S. enflata</i> . . .	2, 3, 5-7, 9, 10, 12-15, . 16, 17, 18, 22-25, 27, 30, 30A, 31-42, 47, 48, 51-61, 63, 66, 67	110,728	1, 4, 8, 11, 19, 20, 26, . 28, 43-46, 49, 50	14,735
<i>S. hexaptera</i> . . .	15 .	3	19, 20, 28, 45 .	64
<i>S. lyra</i> . . .	45, 57, 58, 60 .	517	20, 28, 29, 45 .	117
<i>S. neglecta</i> . . .	12, 14, 15, 16, 18, 22-25, . 27, 30, 30A, 31-42, 47, 48, 51-59, 61, 63	26,904	19, 20, 26, 28, 43-45, . 49	4816
<i>S. pulchra</i> . . .	2, 3, 5, 6, 9, 10, 12-15, . 23, 24, 31, 32, 36, 37, 39-41, 47, 51-59, 63, 66, 67	5326	1, 4, 8, 19 .	137
<i>S. regularis</i> . . .	15, 16, 22, 41 .	174	19, 50 .	42
<i>S. robusta</i> . . .	2, 3, 5-7, 9, 10, 12-15, . 16, 17, 18, 22-25, 27, 30, 30A, 31-38, 40-42, 47, 51-61, 63, 66, 67	22,117	1, 4, 8, 11, 19, 20, 26, . 28, 29, 44, 45, 49, 50	1720
<i>S. serratodentata</i> . . .	6, 7, 15, 16, 27 .	243	19, 20, 50 .	837
<i>K. subtilis</i> . . .	57 .	43	20, 28 .	39
<i>P. draco</i> . . .	7 .	5	19, 20 .	74

Some facts with regard to the occurrence of the different species can be deduced from Table I, having regard at the same time to the actual abundance of the particular species concerned.

S. bedoti.—When present this was fairly abundant inside the reef but was very scarce outside. This is considered to be warm water form of the Indian and Pacific Oceans, and found from the surface to 50 metres.

S. bipunctata.—A scarce form in the present collection. Occurred sporadically both inside and outside the reef. Considered to be a eurythermous warm water form found from 0-50 metres in the Atlantic, Pacific and Indian Oceans.

S. enflata.—The most abundant species in the collection both inside and outside the reef. Some specimens were obtained from every haul taken. This species is typical of the warmest waters of the world, and has been recorded from the Atlantic, Pacific and Indian Oceans, and from the Mediterranean in the upper layers from 0-50 metres.

* All the numbers given in this section were calculated by weighting the numbers actually identified in the sample against the total numbers in the collection as given in the Tables in Vol. II, No. 6 of the Great Barrier Reef Reports.

S. hexaptera.—Very few individuals of this species were caught, and all of these with the possible exception of about three individuals were obtained from stations outside the reef. Only one specimen was mature. This is a warm water form found in the epiplankton of the Atlantic, Pacific and Indian Oceans.

S. lyra.—This species was captured in relatively small numbers, and was taken at only four stations inside the reef. None of the specimens was mature. This is described as a fairly deep water form in the sub-tropical zone of the Atlantic, Pacific and Indian Oceans, and also in the Mediterranean, but it has been captured near the surface.

S. neglecta.—This species was present in considerable numbers. It was taken at stations both inside and outside the reef, though many more at the former than at the latter. Many individuals were mature. It is a warm water species found in the tropical regions of the Indian and Pacific Oceans.

S. pulchra.—A fairly abundant form. Nearly all of the individuals were captured in hauls made at the 3 mi. E. station within the reef. This especially beautiful species is found in the epiplankton of the warmest waters of the Indian and Pacific Oceans.

S. regularis.—This was a rare species and was taken only four times at the 3 mi. E. station. Its distribution is similar to that of the previous species, being found in the epiplankton of the warmest waters of the Indian and Pacific Oceans.

S. robusta.—This was second in abundance after *S. enflata* at stations inside the reef. It has been recorded from the warmest parts of the Atlantic, Indian and Pacific Oceans. It is usually described as epiplanktonic, but it is suggested by Burfield and Harvey (1926) that it may also extend into the upper mesoplankton. In the present collection it should be noted that many individuals were obtained at stations 19, 20, 28, 29 and 50, where the maximum depth fished varies from about 200 m. to 600 m. It is therefore possible that at least some of the individuals were caught well below the surface waters.

S. serratodentata.—This species was present in medium abundance compared with others. It was obtained at five stations within the reef and at three outside the reef. The notable feature of the distribution is, however, that about three-quarters of the total catch was obtained outside the reef. This species is considered to be a eurythermous warm water form, and mainly epiplanktonic, though it does occur in the mesoplankton.

Krohnitta subtilis.—This was one of the rarest species in the present collection. Of these some specimens were taken at Station 57, 3 mi. E. and the remainder at two stations where the maximum depth fished varied from 200 m. to 600 m. This agrees with the recorded distribution of the species which is considered to be a eurythermous warm water form from both epi- and mesoplankton in the Atlantic, Pacific and Indian Oceans.

Pterosagitta draco.—This was also rare in the present collection, being taken at one station within the reef (7), and at two stations outside. All but five of the 79 specimens were taken at the latter stations. It is an epiplanktonic warm water species from the Atlantic, Pacific and Indian Oceans.

B. DISTRIBUTION IN DEPTH.

Chaetognatha were received from only one station (16) 3rd Oct., 1928, at which catches were taken with a closing net at different depths. At this station (3 mi. E.) hauls were taken for 10 minutes at each of six depths, including the surface. The complete data of the Chaetognatha obtained are given in Table II. The number of individuals of each species is given.

TABLE II.—*Total Numbers of Different Species of Chaetognatha Captured with Closing Net at Various Depths at Station 16 (3.x.28).*

Average depth fished (metres).	<i>Sagitta enflata.</i>	<i>S. neglecta.</i>	<i>S. regularis.</i>	<i>S. robusta.</i>	<i>S. serrat.</i>
Surface	6	13	0	8	1
3·1 M.	169	111	9	89	62
8	1504	97	23	188	40
11·1	1111	94	70	47	0
12·5	890	57	14	151	0
16·5	656	92	33	109	0

The above figures are given in the form of depth diagrams in Text-figs. 1-5.

These hauls were taken on a sunny day with a glass calm sea. The only conclusions which appear possible from the above data are that within the reef in October, under the conditions given, all the species were scarce at the surface, *S. regularis* not being present at all. *S. serratodentata* was found only down to about 8 m., and was mainly just beneath the surface. *S. enflata* became gradually less abundant in the deeper hauls with a maximum at 8 m., but *S. neglecta*, *S. regularis* and *S. robusta* showed no obvious sign of any considerable change in abundance, though *S. regularis* showed a maximum at 11·1 m.

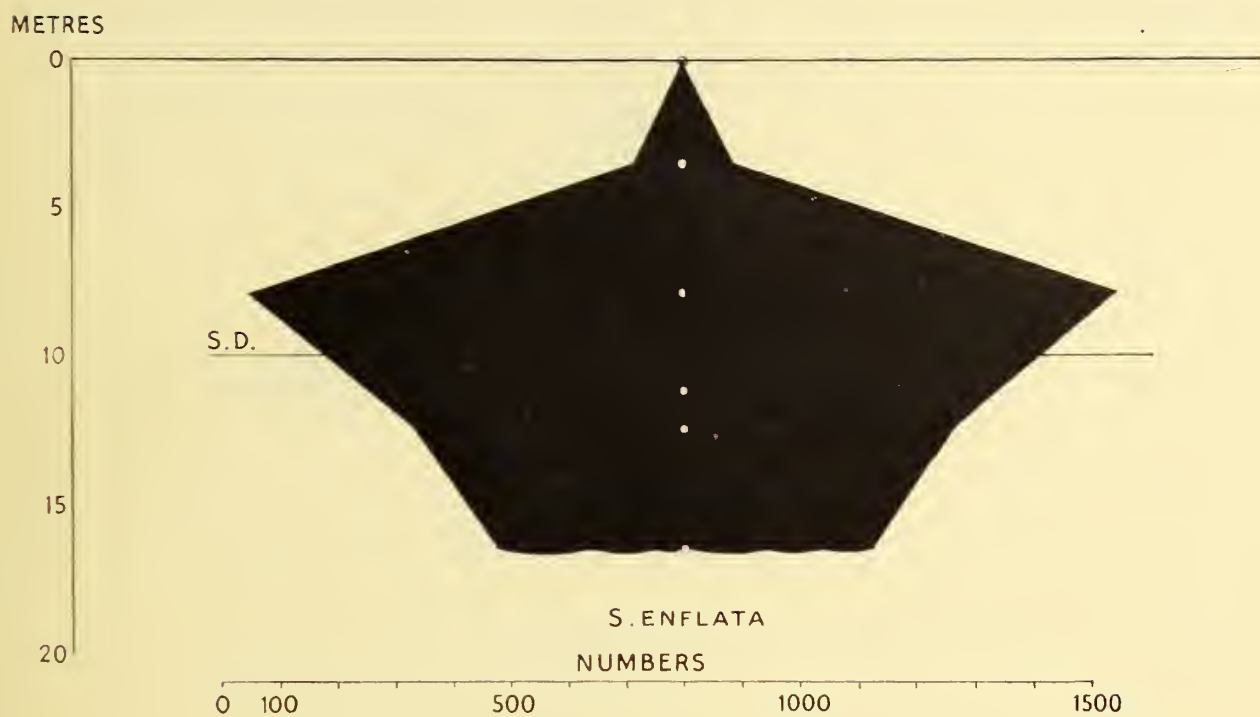
C. DISTRIBUTION BY DAY AND NIGHT.

All the hauls so far considered in this report were made by day. There is only one night haul in the collection of Chaetognatha with precise data. This was Station 21 (3 mi. E.) on 22nd Oct., 1928, at which three half-hour hauls were made, two at 7.46 p.m.—8.16 p.m. and one at 8.40 p.m.—9.10 p.m. The maximum depth fished in these hauls was 20·5 m. for the first two and 22 m. for the third. No hauls were taken on the previous day, 21st Oct., so that the particular interest of these night hauls is found by a comparison of them with the hauls taken at the same location on the following morning, 23rd Oct., 1928. On that occasion (Station 22) two hauls were made from which Chaetognatha have been received. These were taken at 8.49 a.m.—9.19 a.m., and at 9.35 a.m.—10.05 a.m., the maximum depths fished being 20 m. and 20·5 m. respectively.

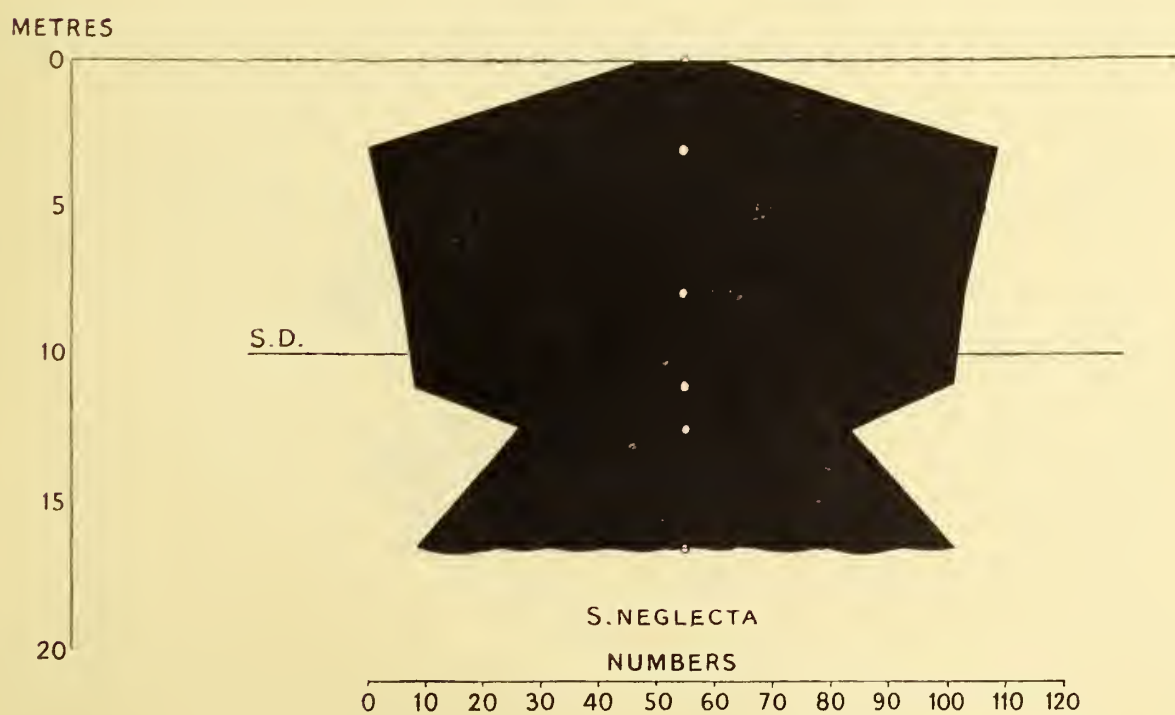
The data for all these hauls are given in Table III.

TABLE III.—*Numbers of Different Species of Chaetognatha captured in Three Night Hauls, Station 21 (22.x.28), and in Two Hauls taken at the Same Position on the Following Morning, Station 22 (23.x.28).*

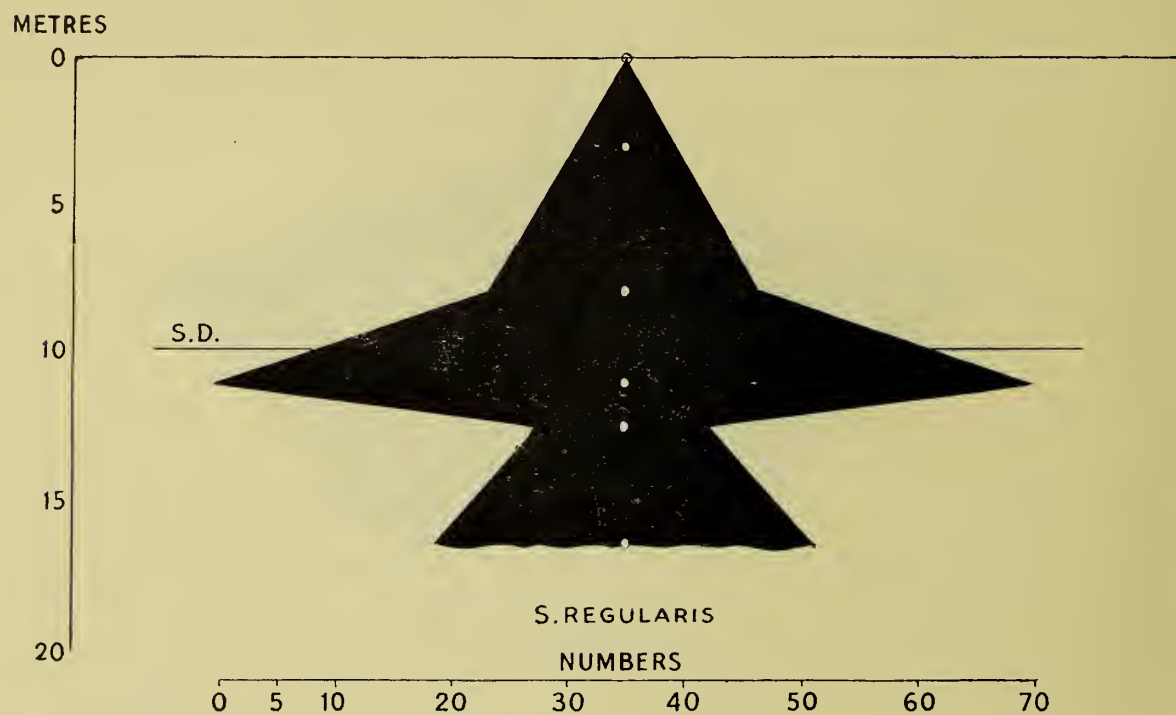
	Night, Oct. 22nd		Morning, Oct. 23rd	
	Total number.	Number per haul.	Total number.	Number per haul.
<i>S. enflata</i>	2970	990	145	73
„ <i>lyra</i>	7	2	0	0
„ <i>neglecta</i>	258	86	77	38
„ <i>pulchra</i>	160	20	0	0
„ <i>robusta</i>	578	192	137	68
„ <i>bipunctata</i>	0	0	7	3
„ <i>regularis</i>	0	0	15	7



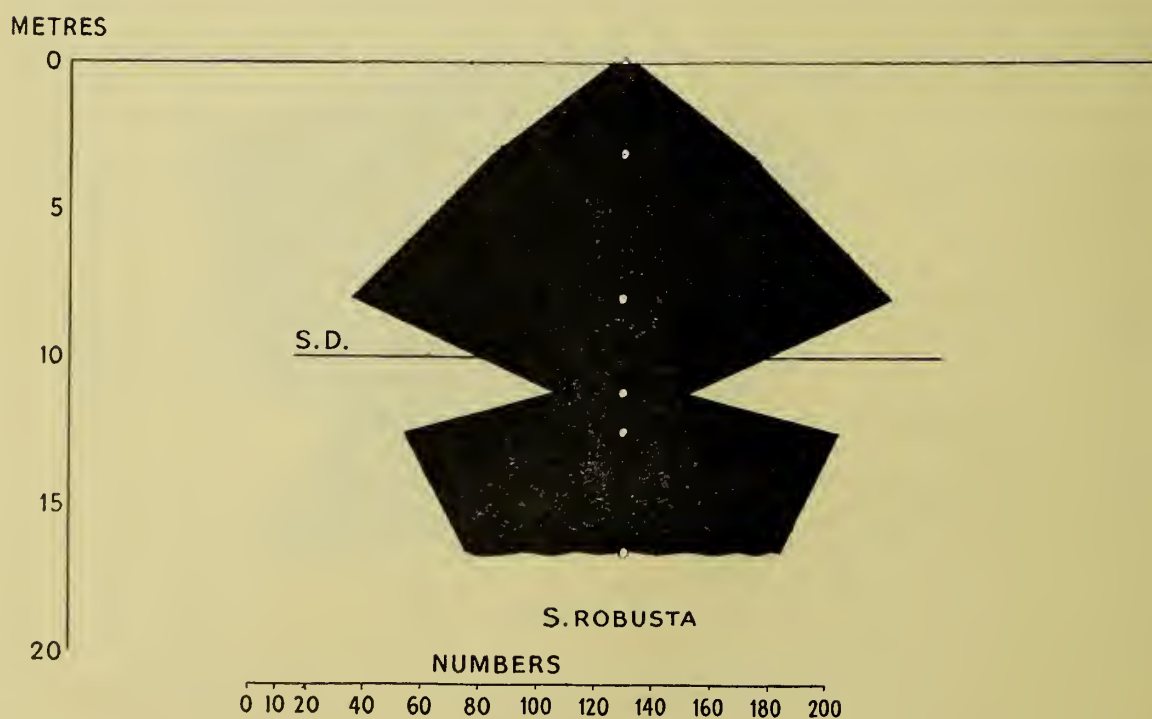
TEXT-FIG. 1.



TEXT-FIG. 2.

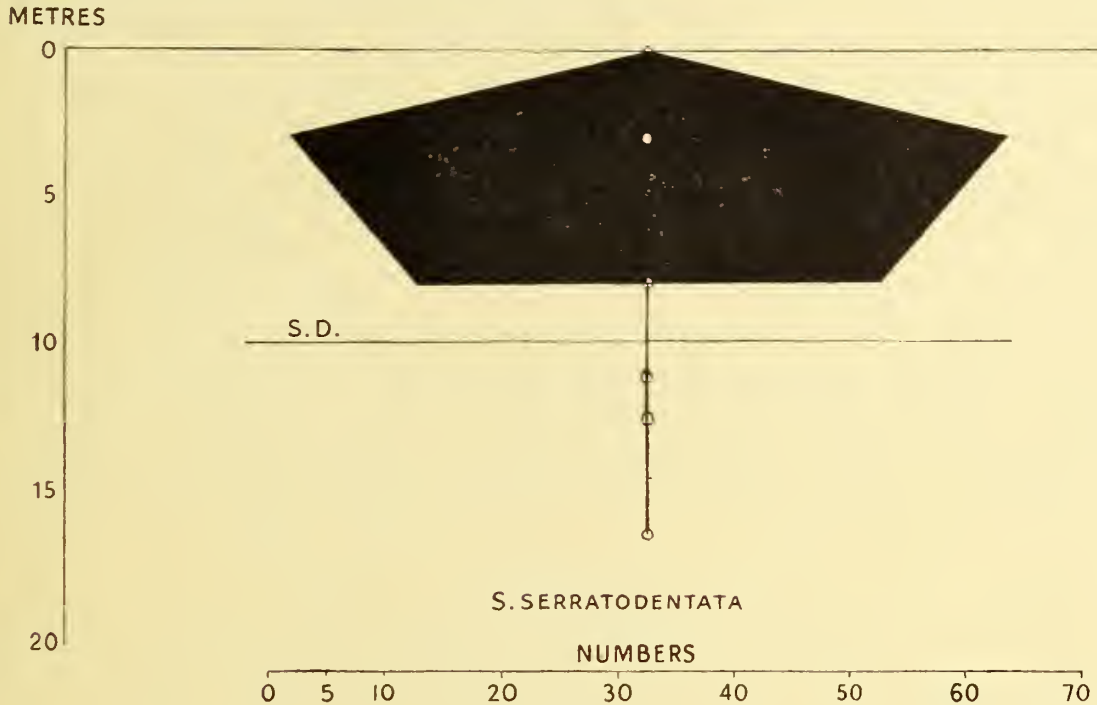


TEXT-FIG. 3.



TEXT-FIG. 4.

In so far as the numbers from these very few hauls indicate any movement of the Chaetognatha by night, it would appear that *S. enflata*, *S. neglecta* and *S. robusta* were more numerous at these depths by night than by day. *S. lyra* and *S. pulchra* were present only at night on this occasion, and *S. bipunctata* and *S. regularis* only during the day, though the numbers of the latter two species were very small.



TEXT-FIG. 5.

TEXT-FIGS. 1-5.—The vertical distribution of the different Species of Chaetognatha captured at Station 16. The circles and white dots indicate the average depths at which the hauls were made. Coarse silk townet. S.D., Secchi disc reading.

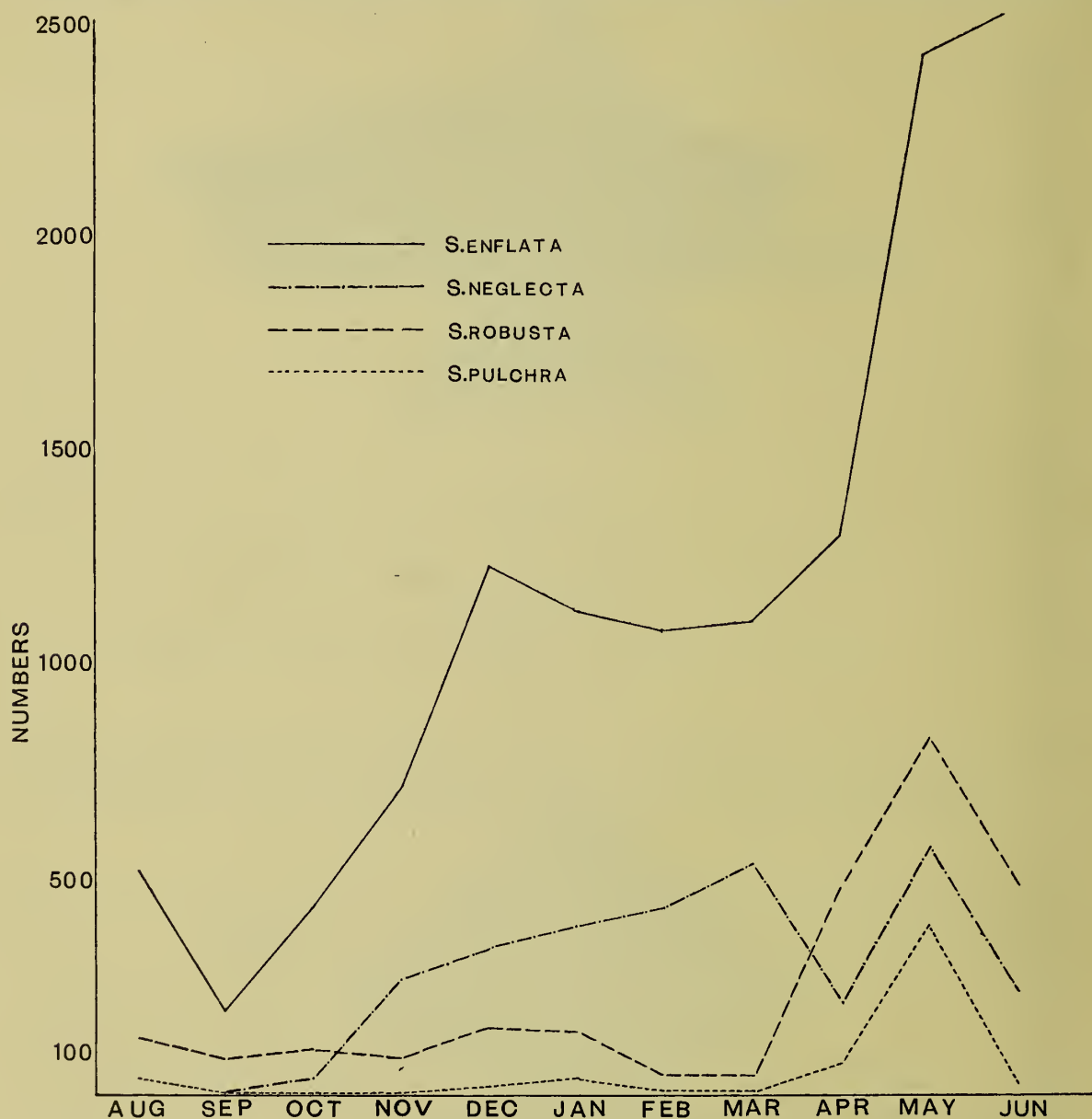
D. DISTRIBUTION THROUGHOUT THE YEAR.

At the station 3 mi. E. the presence (X) or absence (O) of the various species in the catches made from July, 1928 to July, 1929 by day is given in Table IV.

TABLE IV.—Occurrence of Different Species of Chaetognatha in the Barrier Reef Lagoon.

	1928.						1929.						
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
<i>S. bedoti</i> .	×	×	×	×	○	○	○	○	○	○	○	×	×
„ <i>bipunctata</i> .	○	○	×	×	×	○	○	×	○	×	○	○	○
„ <i>enflata</i> .	×	×	×	×	×	×	×	×	×	×	×	×	×
„ <i>hexaptera</i> .	○	○	○	×	○	○	○	○	○	○	○	○	○
„ <i>lyra</i> .	○	○	○	×	○	○	○	○	×	○	×	×	○
„ <i>neglecta</i> .	○	○	×	×	×	×	×	×	×	×	×	×	○
„ <i>pulchra</i> .	×	×	×	×	×	×	×	×	×	×	×	×	×
„ <i>regularis</i> .	○	○	○	×	○	○	○	×	○	○	○	○	○
„ <i>robusta</i> .	×	×	×	×	×	×	×	×	×	×	×	×	×
„ <i>serratodentata</i> .	○	×	○	×	×	○	○	○	○	○	○	○	○
<i>K. subtilis</i> .	○	○	○	○	○	○	○	○	○	○	×	○	○
<i>P. draco</i> .	○	×	○	○	○	○	○	○	○	○	○	○	○
Number of species	4	6	6	10	6	4	4	6	5	5	6	6	4

An interesting feature shown in Table IV is that the maximum number of species was present in October. This corresponds to the finding for the Siphonophora (Vol. II, No. 7, p. 270); October was the period of highest salinity, and it has been suggested that there is a greater survival of species brought in from the deep water under these conditions.



TEXT-FIG. 6.—The average catches per haul of four different species of Chaetognatha for each month with the coarse and fine silk and 1-metre stramin nets, at the position three miles east of Low Isles, in the barrier reef lagoon.

Of those species which were present in the greatest number, *S. enflata* and *S. robusta* appeared throughout the year. *S. neglecta* was absent during July and August. *S. pulchra* was also obtained throughout the year and was fifth in order of abundance (*vide* Table I). *S. bedoti* was absent from November to May. The remaining species appeared sporadically and in relatively small numbers. It is therefore impossible to state whether any of these was entirely absent for a particular period in the year.

An attempt was made to discover whether the data of numbers caught of the most abundant species at the 3 mi. E. station would indicate any significant variations in abundance at different times of the year. To mitigate any effect of daily changes in the conditions the average number of individuals per 30 min. oblique haul for each month* was taken for each of the species *S. enflata*, *S. robusta*, *S. neglecta* and *S. pulchra*.

The results are represented graphically in Text-fig. 6.

The most noticeable feature applying to all four species is that they all show a period of maximum abundance in May.

S. enflata remained the most abundant species throughout the year, with a maximum in May and June and a minimum in September.

S. neglecta gradually increased in numbers from a minimum in September, to a maximum in May, with a temporary fall in April and a second fall in June. From November to March this species was second in abundance, but from April to June it was surpassed in numbers by *S. robusta*.

S. robusta was caught in medium numbers from August to March, but rapidly became more abundant in April and reached a maximum as the second most abundant species in May, falling off again in June, but remaining in the same order of abundance.

S. pulchra was taken in small numbers from August to March, but, as in previous species, then increased to a maximum in May, and fell off again in June.

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* The months of July, 1928 and 1929 have been omitted because Chaetognatha were received from very few hauls during these two periods.